AMENDMENTS TO THE CLAIMS:

1. (Currently Amended) An amorphous computing system for computing seismic images, the system comprising:

a first amorphous hardware element;

a computer processor communicably coupled to the amorphous hardware element and to a computer readable medium, wherein the computer readable medium includes instructions executable by the computer processor to:

define a first plurality of hardware gates ~~associated~~ within the amorphous hardware element to form a first processing pipeline, wherein the first processing pipeline is operable to update a first seismic image point; and

define a second plurality of hardware gates ~~associated~~ within the amorphous hardware element to form a second processing pipeline, wherein the second processing pipeline is operable to update a second seismic image point independent of the first processing pipeline.

2. (Original) The system of claim 1, wherein the computer readable medium further includes a set of coefficients for a high frequency filter corresponding to a threshold noise frequency and a set of coefficients for a sinc filter.

3. (Previously Presented) The system of claim 2, wherein the first processing pipeline and the second processing pipeline include functions operable to implement at least some elements of a Kirchhoff algorithm, and wherein the functions include:

a first function, wherein the first function interpolates a velocity function to calculate a velocity at an image point;

a second function, wherein the second function utilizes the velocity to calculate a time of a data trace that contributes to the image point;

a third function, wherein the third function utilizes the time of the data trace to calculate a real sample number of the data trace, and wherein the real sample number of the data trace is a fractional offset from a whole sample number of the data trace;

a fourth function, wherein the fourth function filters a plurality of whole sample numbers of the data trace that straddle the real sample number of the data trace using the

set of coefficients for a high frequency filter;

a fifth function, wherein the fifth function uses the set of coefficients for a sinc filter to interpolate the filtered plurality of whole number samples to the real sample number; and

a sixth function, wherein the sixth function sums the output of the fifth function into an output trace at the image point.

4. (Previously Presented) The system of claim 1, wherein the first processing pipeline and the second processing pipeline include functions operable to implement at least some elements of a wave equation algorithm, and wherein the functions include:

an update function, wherein the update function creates a set of simultaneous equations that will distribute energy from the data trace to a set of output image points located on an x,y,z coordinate grid;

a tri-diagonal solver function, wherein the tri-diagonal solver function solves the set of simultaneous functions; and

a thin lense adjustment function, wherein the thin lense adjustment function compensates for a lateral velocity gradient.

5. (Previously Presented) The system of claim 1, wherein the amorphous hardware element comprises a first field programmable gate array, and wherein the system further comprises:

a second field programmable gate array communicably coupled to the computer processor, wherein the computer readable medium further includes instructions executable by the computer processor to:

define a third plurality of hardware gates within the second field programmable gate array to form a third processing pipeline, wherein the third processing pipeline is operable to update a third seismic image point independent of the first processing pipeline and the second processing pipeline.

6. (Previously Presented) The system of claim 1, wherein the amorphous hardware element comprises a field programmable gate array, and wherein the computer processor comprises a reduced instruction set computer processor.

7-19. (Canceled)

20. (Previously Presented) A system for implementing a Kirchhoff algorithm, the system comprising:

a field programmable gate array;

a computer processor communicably coupled to the field programmable gate array and to a computer readable medium, wherein the computer readable medium includes a set of coefficients for a high frequency filter corresponding to a threshold noise frequency and a set of coefficients for a sinc filter, and instructions executable by the computer processor to:

define a first plurality of hardware gates within the field programmable gate array to form a first processing pipeline, wherein the first processing pipeline is operable to update a first seismic image point, and wherein the first processing pipeline implements the following functions:

a first function, wherein the first function interpolates a velocity function to calculate a velocity at an image point;

a second function, wherein the second function utilizes the velocity to calculate a time of a data trace that contributes to the image point;

a third function, wherein the third function utilizes the time of the data trace to calculate a real sample number of the data trace, and wherein the real sample number of the data trace is a fractional offset from a whole sample number of the data trace;

a fourth function, wherein the fourth function filters a plurality of whole sample numbers of the data trace that straddle the real sample number of the data trace using the set of coefficients for a high frequency filter;

a fifth function, wherein the fifth function uses the set of coefficients for a sinc filter to interpolate the filtered plurality of whole number samples to the real sample number;

a sixth function, wherein the sixth function sums the output of the fifth function into an output trace at the image point;

define a second plurality of hardware gates within the field programmable gate array to form a second processing pipeline, wherein the second processing pipeline is operable to update a second seismic image point independent of the first processing pipeline, and wherein the

second processing pipeline implements the following functions:

the first function, wherein the first function interpolates a velocity function to calculate a velocity at an image point,

the second function, wherein the second function utilizes the velocity to calculate a time of a data trace that contributes to the image point;

the third function, wherein the third function utilizes the time of the data trace to calculate a real sample number of the data trace, and wherein the real sample number of the data trace is a fractional offset from a whole sample number of the data trace;

the fourth function, wherein the fourth function filters a plurality of whole sample numbers of the data trace that straddle the real sample number of the data trace using the set of coefficients for a high frequency filter;

the fifth function, wherein the fifth function uses the set of coefficients for a sinc filter to interpolate the filtered plurality of whole number samples to the real sample number; and

the sixth function, wherein the sixth function sums the output of the fifth function into an output trace at the image point.

21. (Previously Presented) A method of computing a plurality of seismic output traces from a plurality of seismic input traces, the method comprising:

segregating the input traces into a plurality of sets of input traces;

programming groups of hardware gates within an amorphous hardware element, each group of programmed hardware gates comprising a separate processing pipeline implementing at least a portion of a seismic imaging algorithm; and

operating the amorphous hardware element to process at least a portion of the plurality of sets of input traces through the processing pipelines into at least a portion of the plurality of output traces.

22. (Previously Presented) The method of claim 21 further comprising:

initializing an output image file in memory associated with the amorphous hardware element, the output image file comprising the plurality of output traces; and

reading the plurality of input traces into memory associated with the amorphous hardware element.

23. (Previously Presented) The method of claim 22 wherein in said steps of initializing and reading, the output image file is initialized in memory external from the amorphous hardware element and the plurality of input traces are read into memory internal to the amorphous hardware element.

24. (Previously Presented) The method of claim 21 wherein said step of segregating comprises:

identifying groups of output traces;

associating each group of output traces with a group hardware gates comprising one of the processing pipelines;

assembling input traces relevant to each group of output traces into the sets of input traces; and

assigning each set of input traces to the processing pipeline comprising the group of hardware gates associated with the group of output traces to which each set of input traces is relevant.

25. (Previously Presented) The method of claim 21, wherein the at least a portion of the seismic imaging algorithm includes elements of a Kirchhoff algorithm.

26. (Previously Presented) The method of claim 25, wherein the method further comprises:

generating a set of coefficients for a high frequency filter corresponding to a threshold noise frequency and a set of coefficients for a sinc filter.

27. (Previously Presented) The method of claim 26, wherein in said step of generating, each of the high frequency filter and the sinc filter includes at least twenty points.

28. (Previously Presented) The method of claim 26, wherein, for each processing pipeline, said step of operating comprises:

interpolating a velocity function to calculate a velocity at an image point;

utilizing the velocity to calculate a time of an input trace that contributes to the image

point;

calculating a real sample number of the input trace using the time of the input trace, the real sample number of the input trace comprising a fractional offset from a whole sample number of the input trace;

filtering a plurality of whole sample numbers of the input trace that straddle the real sample number of the input trace using the set of coefficients for the high frequency filter;

using the set of coefficients for the sinc filter to interpolate the high frequency filtered plurality of whole number samples to the real sample number; and

summing the output of the sinc filter into an output trace at the image point.

29. (Previously Presented) The method of claim 21, wherein the at least a portion of the seismic imaging algorithm includes elements of a wave equation algorithm.

30. (Previously Presented) The method of claim 29, wherein, for each processing pipeline, said step of operating comprises:

creating a set of simultaneous equations that distribute energy from an input trace to a set of output image points located on an x,y,z coordinate grid, the set of simultaneous equations with boundary conditions comprising a tri-diagonal matrix;

solving the tri-diagonal matrix to obtain a set of values representing a contribution of the input trace to the set of output image points;

applying a thin lense adjustment compensating for a lateral velocity gradient to the set of values to obtain an adjusted value; and

summing the adjusted value into the output trace.

31. (Previously Presented) The method of claim 21, wherein in said step of programming hardware gates within the amorphous hardware element, a first group of hardware gates within the amorphous hardware element is programmed to form a first processing pipeline, and a second group of hardware gates within the amorphous hardware element is programmed to form a second processing pipeline.

32. (Previously Presented) The method of claim 31, wherein in said step of operating

the amorphous hardware element, the first processing pipeline updates a first seismic image point and the second processing pipeline updates a second seismic image point.

33. (Previously Presented) The method of claim 32, wherein in said step of operating the amorphous hardware element, the first processing pipeline operates independent of the second processing pipeline.

34. (Previously Presented) The method of claim 21, wherein the amorphous hardware element comprises a field programmable gate array communicably coupled with a general purpose computer processor.

35. (Previously Presented) The method of claim 34 wherein the general purpose computer processor comprises a reduced instruction set computer processor.

36. (Previously Presented) The method of claim 21, wherein in said step of operating the amorphous hardware element, each of the processing pipelines operates to update a seismic image point in parallel with others of the processing pipelines.

37. (Previously Presented) The method of claim 21, further comprising:

programming groups of hardware gates within at least one additional amorphous hardware element, each group of hardware gates comprising a separate processing pipeline implementing at least a portion of a seismic imaging algorithm; and

operating the at least one additional amorphous hardware element to process at least a portion of the sets of input traces into at least a portion of the output traces.

38. (Previously Presented) The method of claim 37 wherein the amorphous hardware elements comprise field programmable gate arrays communicably coupled with a general purpose computer processor.

39. (Previously Presented) The method of claim 38 wherein the general purpose computer processor comprises a reduced instruction set computer processor.